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Teaching Database Design with Software Animations

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ABSTRACT

Understanding database design is central to understanding a good data model and an effective database implementation. This tutorial presents a set of software animations developed to support the teaching of database design concepts. Topics covered by the animations include ER notation sets, mapping Scenarios to ER diagrams, mapping ER diagrams to tables and normalization. The animations comprise one module of an Animated Database Courseware project funded under the National Science Foundation Course, Curriculum, and Laboratory Improvement program. The courseware has been made freely available and may be accessed at http://adbc.kennesaw.edu.

Keywords: database, database design, software animations

I. TUTORIAL

Database technology is a core knowledge area in computing curriculum. A good database is predicated on good database design. Database design involves the conceptualization of an underlying data model and determining an appropriate structure to be utilized in the physical implementation of that model. As many database faculty know, and formally stated by the database textbook author, David Kroenke, (2008), “database design is both difficult and important” (p.13).

This tutorial demonstrates a set of software animations developed to support the teaching of database design. The animations are fairly intuitive to

use and are independent of any specific database text or product. They are intended to provide supplemental instructional support. The animations are part of a larger animated database courseware project funded through a National Science Foundation Course, Curriculum and Laboratory Improvement grant. The courseware is freely available and can be accessed at http://adbc.kennesaw.edu. The database design module focuses on the relational database model. In this tutorial, the following topics will be covered:

ER Notation Sets – Since Entity Relationship (ER) diagrams were introduced by Peter Chen in 1976, several different notation sets have been utilized in their creation. This can be confusing as different texts and different software programs use different symbol sets. The purpose of this animation is to allow users to quickly associate one notation set with another. The animation consists of seven different relationships with six different notation sets displayed.

Scenario to ER – Data models are built from an analysis of a problem scenario which can be visually depicted as entity relationship diagrams displaying entities and the relationships between them. This sub-module includes a set of 8 different problem scenarios in which users are presented with four possible ER diagram solutions and asked to choose the best one.

ER to Table – Entity Relationship diagrams form the basis for physical implementation. An ER diagram is mapped to a set of corresponding tables. This sub-module includes a set of 7 different relationships and asks users to determine, from a choice of four possible options, the best way to map that relationship to tables. The result of each option, whether the best solution or not, is demonstrated.

Constructing an ER Diagram - This sub-module provides another way to reinforce learning related to the creation of Entity Relationship diagrams. In

this sub-module users are presented with a scenario and asked to construct a corresponding ER diagram. A process is provided that checks progress based on completeness and accuracy.

Normalization – Normalization is the process of organizing data into tables with the goal of reducing redundancies thereby reducing data anomalies. This sub-module includes a tutorial demonstrating data normalized into first, second and third normal forms. A set of exercises are included in which users are presented with a scenario, a set of data and a set of functional dependencies, and asked to normalize the data into tables representing third normal form.

Denormalization - Although the usual approach in relational database design is to normalize tables in order to eliminate update anomalies, normalization may not always be the most desirable design strategy. Certain situations, including read only databases and the need for optimized query retrieval time, are more suitable to denormalization. This animation presents a scenario and asks users to choose the situation in which denormalization might be appropriate. The result of each option, whether the best solution or not, is demonstrated.

The tutorial will also discuss ways in which the animations can be used in the classroom, the lab or as out-of-class assignments. This will be an interactive session and participants will be asked to share their ideas for enhancing database instruction.

REFERENCES

Animated Database Courseware (ADbC). http://adbc.kennesaw.edu (current August 22, 2008)

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